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ABSTRACT

This paper opens by describing research since 1975 (McCrae and Costa) on a set of related traits that identified as aspects of Openness to Experience. The historic roots of the concept of Openness to Experience are traced. Data are provided on the convergent and discriminant validity of the six Revised NEO-Personality Inventory facets of Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values. Factor analyses are reported that demonstrate that these traits covary to define a broad dimension that can appropriately be called "Openness." It is shown that they are weakly and inconsistently related to psychometric measures of intelligence and to self-report measures of Intellectance that emphasize academic ability. These data are claimed to suggest that the fifth basic dimension of personality is better constructed as Openness than as Intellect. Finally, the book, "A Natural History of the Senses," by Diane Ackerman, is introduced and recommended for those who wish to gain a phenomenological perspective on Openness. (Contains 30 references.) (ABL)

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Openness to Experience as a Basic Dimension of Personality

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Since 1975, Paul Costa and I have conducted research on a set of related traits that we identified as aspects of Openness to Experience. Analyses of the scales of Cattell's Sixteen Personality Factor Questionnaire (16PF; Cattell, Eber, & Tatsuoka, 1970) had suggested three broad clusters; two of them were the ubiquitous dimensions of Neuroticism and Extraversion, or Anxiety and Exvia, as Cattell called them. The third included scales B, Bright; I, Tender-minded; M, Imaginative; and Q1, Liberal thinking, a combination we interpreted as "openness to both affective and cognitive experiences" (Costa & McCrae, 1976, p. 568).

We soon discovered many psychometric limitations in the 16PF, and began to measure Openness with Coan's (1972) Experience Inventory, an instrument derived from the earlier work of Fitzgerald (1966), which in turn was based on Scandinavian studies of hypnotic susceptibility (As, O'Hara, & Munger, 1962) and on Kris's (1952) psychoanalytic conception of creativity. We modified Coan's scales, eventually developing measures for six aspects, or facets, of Openness to Experience. These became the basis for what is now the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992).

In 1983 we began to study the work of Goldberg (1981, 1982) on the structure of traits adjectives, and noted conceptual correspondences between his Factor V, Culture or Intellect, and Openness. Empirical demonstrations of the convergence of these two constructs in both self reports (McCrae & Costa, 1985b) and peer ratings (McCrae & Costa, 1987) made us among the first converts to the five-factor model.

This brief history illustrates two points: First, it shows that our concept of Openness to Experience had its roots outside the lexical tradition in which the Big Five were identified; and second, it shows the pervasiveness of the construct in many different theoretical contexts. These two facts have led us to the conclusion that whereas Intellect is a basic factor of English-language trait adjectives, Openness is a basic dimension of personality itself, imperfectly represented by the lay terms that define Intellect. The contrast between these two different conceptions has been the focus of previous articles and chapters (McCrae, 1990; McCrae & Costa, 1985a, 1985b, in press); today I hope to communicate the nature of the construct through a review of data and a case study.

Definition and Measurement of Openness

We regard Openness to Experience as a broad dimension of individual differences with both structural and motivational aspects: "Openness is seen in the breadth, depth, and permeability of consciousness, and in the recurrent need to enlarge and examine experience" (McCrae & Costa, in press, p. 2). The structural aspect of Openness recalls Rokeach's (1960) classic conception of dogmatism in terms of compartmentalized beliefs, and Hartmann's (1991) more recent descriptions of thick and thin boundaries in the mind. The motivational aspect suggests links to Murray's (1938) needs for understanding, change, and sentience, and to Zuckerman's (1979) Experience Seeking.

Our measure of Openness, however, is not organized along these two lines. When items measuring a variety of forms and manifestations of Openness are factored, we do not

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find a Structure factor and a Motivation factor. Instead, factors correspond to specific *areas* to which individuals are relatively open or closed: fantasy, aesthetics, feelings, actions, ideas, and values. Table 1 shows the results of a varimax-rotated factor analysis of the 48 Openness items, partialling a measure of acquiescence. Several of the Ideas items load jointly on the Ideas and the Aesthetics factors, but otherwise the intended structure is generally recovered. Incidentally, this is a fully independent replication of the initial analyses used to select items, and supports the facet model at an item level.

We obtain this clear separation of item factors because the traits that constitute the domain of Openness are rather loosely related. As Trapnell and Wiggins (1990) remarked, "The fifth factor of the Big Five model appears to be broader in scope and looser in structure than the other four factors" (p. 782). Certainly this is true in the NEO-PI-R. Table 2 shows the intercorrelations of the six facets; the median correlation is .28, smaller than the median correlation for any of the other domains. Yet, as the last column of Table 2 shows, when the six facet scales are analyzed, a single factor has an eigenvalue over 1.0, and all six facets show strong loadings on it.

Even more revealing is an analysis of the full set of 30 NEO-PI-R facet scales. Two such analyses are shown in Table 3; one for the self-report version, Form S, and one for the observer ratings version, Form R. Note particularly the boxed area, showing that all six Openness facets load strongly on an unmistakable O factor in both data sets. The Openness factor is very broad, but it is also very robust.

This symposium is devoted to a conceptual analysis of Factor V, and the most relevant data are likely to be correlations with external criteria that can provide a nomological net for the interpretation of the factor. Table 4 summarizes correlations between the domain and facet scales of Openness and a series of related measures. Some of these other measure--the names shown in boldface--have been proposed as alternative measures of Factor V: These are scales by Wiggins, Goldberg, Lorr, and Hogan, although it should be noted that Lorr's Autonomy was identified as a measure of Factor V by Digman (1990), not by Lorr himself. The other scales are empirical correlates.

The first noteworthy feature of Table 4 is that it is covered with asterisks. NEO-PI-R Openness scales are significantly related to a wide variety of other scales. This applies to each of the facet scales, as well as to their total, and provides further evidence that all six facets belong together in a single domain, because they share many important correlates.

Next, a consideration of the correlations given in boldface--the highest facet correlation of each measure--provides evidence of the discriminant validity of the facet scales. For example, Holland's (1985) Artistic Interests is most strongly correlated with the Aesthetics facet; his Investigative Interests with the Ideas facet. Private self-consciousness (Fenigstein, Scheier, & Buss, 1975) is most closely related to Openness to Feelings; Jackson's (1984) need for Change is most closely related to Openness to Actions.

Finally, note that the correlates have been arranged in descending order according to their correlation with total Openness. Among these scales, the Sensing-Intuition continuous scale of the MBTI and Wiggins's Openness adjective scale come closest to measuring our construct of Openness. Goldberg's Intellect scale shows a substantial correlation, .46, but this is lower than many other scales, such as Absorption and Experience Seeking, that were not developed as measures of Factor V.

At the bottom of the table is the Intellectance scale of the Hogan Personality Inventory (HPI; Hogan, 1986). As we might expect, this scale shows a substantial correlation--.47--with Openness to Ideas, but it is unrelated to Openness to Fantasy, Feelings, Actions, and Values. HPI Intellectance appears to measure only one facet of the domain of Openness,

and Intellectance and Openness should not be regarded as equivalent or interchangeable measures of Factor V.

Of course, Hogan's Intellectance scale was not intended to measure our construct of Openness to Experience; instead, the homogeneous item clusters, or HICs, that define Intellectance include measures of self-reported academic ability as well as measures of curiosity. When Trapnell and Wiggins (1990) factored the Intellectance HICs, they found that these two sets of HICs formed different factors, of which only the Curiosity factor was related to Openness.

This leads us to consider the relation between Openness and Intelligence. Table 5 shows correlations between age-adjusted WAIS-R scores and NEO-PI Openness scales in a sample of 67 men and women aged 17 to 86. What is most notable here is the general absence of asterisks. Full scale IQ is related only to Openness to Ideas and to Total Openness, and the correlations are modest in magnitude. Intelligence, I suggest, is a sixth dimension of individual differences, only slightly related to Openness.

It is interesting to note that the largest correlates of total Openness are Block Design and Object Assembly, which, according to Wechsler (1958, p. 80) "seem to get at some sort of creative ability." That brings us back to the origins of the concept of Openness in theories of creativity.

Openness and the Senses

The five-factor model is intended to guide a comprehensive taxonomy of personality traits. If Factor V is narrowly construed as Intellect, where shall we classify such traits as need for variety (Maddi & Berne, 1964), sensation seeking (Zuckerman, 1979), and aesthetic reactivity? These traits, that emphasize an interest in sensory rather than intellectual experience, fit well within the broader conception of Factor V as Openness. In deepening one's understanding of this dimension, it may be particularly illuminating to attend to these other, non-intellectual traits.

One of the strongest correlates in Table 4 is the need for sentience, defined by Henry Murray (1938, p. 169) as the need "To seek and find delight in the enjoyment of any . . . sense impressions. To have delicate, sensitive perceptions. To perceive and comment upon the sensuous quality of objects. To remark upon the atmosphere, the temperature, colours in the room, pictures, various sounds and odours. To remember and in the description of events include sensuous details."

This is openness of a very direct and elemental sort, a literal opening of one's eyes and ears to the world around one. Before the chapters on learning and cognition, introductory psychology texts include chapters on sensation and perception. But if you would really like to understand sentience--and Openness to Experience--I recommend a different text: Dr. Diane Ackerman's (1990) *A natural history of the senses*. Here is a book that tells us how perfumers combine five hundred ingredients to create a new fragrance, why women in the American South eat clay, what it must feel like to be burned at the stake. It chronicles the fate of autumn leaves from their first color to their final decay, and describes the afterimages of icebergs that float in the mind's eye after a day of sailing in the Antarctic.

Murray tells us that people who attend to sensuous details like this are high in the need for sentience, and even a causal reading of *A natural history of the senses* suggests that its author, Diane Ackerman, is extremely open to experience. The scope of the book is one clue. It draws on literature and history, experimental psychology, cultural anthropology, popular culture, and personal experience to give us a taste of the senses. The author must have broad interests to pursue so many tangents.

A second, more subtle, clue is found in the structure of the book. This is no

encyclopedia of the senses, methodically and mechanically tracing the physiology and psychology, the historic, aesthetic, and economic significance of each of the senses in turn. Instead, it is a loose collection of essays, grouped by sense, and internally arranged in a structure that sometimes seems to be free association. A five-page chapter on "The Hand" begins with a palm reading in upstate New York, and touches insightfully on the cross-cultural use of worry beads; a blind hair stylist from Lancaster, Pennsylvania; the FBI's use of laser technology for reading fingerprints; the introduction of the business handshake with the Industrial Revolution in England; and Rilke's description of Rodin's sculpting of hands. Woven together by the skillful hands of the author, this kaleidoscopic treatment makes the topic constantly engaging; it also demonstrates the "breadth, depth, and permeability of consciousness" that distinguishes Openness.

Finally, Openness can be discerned in the bits of autobiography that appear from time to time in the book. Dr. Ackerman is a professor of literature with five published collections of poems, but she is no staid academic. She has worked on a cattle ranch in New Mexico, tagged monarch butterflies in California, and vacationed in Antarctica. She clearly has a sense of adventure and a willingness to experiment that distinguishes Openness from mere Intellect.

In fact, we might expect that she would even be willing to participate in this Symposium, in the form of a case study. When I wrote to her a few months ago asking if she would be interested in completing a personality questionnaire and serving as an illustration of a psychological construct, she promptly telephoned to say that she found the idea "intriguing." She subsequently completed the NEO-PI-R, still blind, of course, to the particular construct I was interested in. With a T-score of 82, her cardinal feature is Openness to Experience, as hypothesized. On the facet level, she scores high on Openness to Ideas and Actions, and very high on Openness to Fantasy, Aesthetics, Feelings, and Values. Her NEO-PI-R Interpretive Report begins,

The most distinctive feature of this individual's personality is her standing on the factor of Openness. Very high scorers like her have a strong interest in experience for its own sake. They seek out novelty and variety, and have a marked preference for complexity. They have a heightened awareness of their own feelings and are perceptive in recognizing the emotions of others. They are very responsive to beauty in art and nature. Their attraction to new ideas and alternative values systems may make them especially tolerant of others, and may lead them to adopt unconventional attitudes. Peers rate such people as imaginative, daring, independent, and creative.

That is what Factor V means to me.

Conclusion

Today I have traced some of the historic roots of the concept of Openness to Experience and provided some data on the convergent and discriminant validity of the six NEO-PI-R facets of Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values. I have reported factor analyses that demonstrate that these traits covary to define a broad dimension that can appropriately be called "Openness" (cf. Glisky, Tataryn, Tobias, Kihlstrom, & McConkley, 1991). I have also showed that they are weakly and inconsistently related to psychometric measures of intelligence and to self-report measures of Intellectance that emphasize academic ability. These data suggest to me that the fifth basic dimension of personality is better construed as Openness than as Intellect. Finally, I have introduced you to *A natural history of the senses*, a book which I strongly recommend for those who wish to gain a phenomenological perspective on Openness (as well as on its own merits).

To advance scientific constructs we must not only appeal to the rational scientific mind; we must also fire the scientific imagination. I hope I have done a little of both today.

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Table 1
Factor Analysis of NEO-PI-R Openness Items, Partialling Acquiescence

Varimax Rotated Principal Component: Openness to . . .						
Item	O1: Fantasy	O2: Aesthetics	O3: Feelings	O4: Actions	O5: Ideas	O6: Values
O1 1	44					
O1 2	-59					
O1 3	65					
O1 4	-73					
O1 5	67					
O1 6	-61					
O1 7			-31			
O1 8	-55					
O2 1	35	33				
O2 2		-44				
O2 3		-53		-30		
O2 4	38	30				
O2 5		-67				
O2 6		57				
O2 7		71				
O2 8		62				
O3 1			52			
O3 2			-59			
O3 3			50			
O3 4			60			
O3 5			-54			
O3 6			-40			
O3 7			31			
O3 8	38					
O4 1				31	34	
O4 2				-47		
O4 3	-30			-35		
O4 4				37		
O4 5				-58		
O4 6				-55		
O4 7				-45		
O4 8				37		
O5 1		31			62	
O5 2					66	
O5 3					67	
O5 4		-48			-42	
O5 5		-38			-53	
O5 6		-44			-46	
O5 7		33			58	
O5 8		36			56	
O6 1						59
O6 2						-39
O6 3						-58
O6 4						59
O6 5						-49
O6 6						54
O6 7						-40
O6 8						-62

Note: $N = 1,539$ men and women from Costa, McCrae, & Dye, 1991. All loadings $\geq \pm .30$ are given. Acquiescence is assessed as summed agreement with responses to all NEO-PI-R items (excluding Openness items) without regard to keying.

Table 2
Intercorrelations Among NEO-PI-R Openness Facet Scales

Facet	Openness Facet Scale						General Factor Loading
	O1	O2	O3	O4	O5	O6	
O1: Fantasy		.28	.39	.24	.30	.24	.64
O2: Aesthetics			.39	.34	.46	.13	.71
O3: Feelings				.23	.25	.17	.64
O4: Actions					.31	.28	.62
O5: Ideas						.25	.69
O6: Values							.49
Median:	.28	.34	.25	.28	.30	.24	

Note: $N = 500$ men, 500 women. Adapted from Costa & McCrae, 1992; all $p < .001$.

Table 3
Factor Analysis of NEO-PI-R Form S and Form R Facet Scales

		Varimax Rotated Principal Component									
		N		E		O		A		C	
NEO-PI-R	Facet	Form S	Form R	Form S	Form R	Form S	Form R	Form S	Form R	Form S	Form R
N1:	Anxiety	82	86								
N2:	Angry Hostility	68	51					-46	-68		
N3:	Depression	80	83								
N4:	Self-Consciousness	72	76								
N5:	Impulsiveness	55	43								-47
N6:	Vulnerability	70	67							-40	-46
E1:	Warmth			74	69				48		
E2:	Gregariousness			72	84						
E3:	Assertiveness			48	50			-40		40	
E4:	Activity			51			40			48	42
E5:	Excitement Seeking			57	53						
E6:	Positive Emotions			73	65						
O1:	Fantasy					60	62				
O2:	Aesthetics					76	69				
O3:	Feelings	41			52	52	46				
O4:	Actions					60	52				
O5:	Ideas					76	77				
O6:	Values					54	57				
A1:	Trust							49	75		
A2:	Straightforwardness							70	81		
A3:	Altruism			48				59	77		
A4:	Compliance							74	81		
A5:	Modesty							59	78		
A6:	Tender-Mindedness							61	70		
C1:	Competence									62	74
C2:	Order									69	75
C3:	Dutifulness									69	76
C4:	Achievement Striving									76	75
C5:	Self-Discipline									74	82
C6:	Deliberation									58	61

Note. N = 1,539 self-reports for Form S, 368 peer and spouse ratings for Form R. Adapted in part from Costa, McCrae, & Dye, 1991. All loadings over $\pm .40$ are shown. Decimal points are omitted.

Table 4
Correlations of NEO-PI Openness Scales with Related Measures

	Openness Domain Scale	Openness Facet Scale					
		Fantasy	Aesthetics	Feelings	Actions	Ideas	Values
MBTI Intuition (367)	.71***	.44***	.58***	.29***	.55***	.58***	.35***
IASR-B5 Openness^a (941)	.67***	.42***	.55***	.44***	.32***	.62***	.30***
Absorption ^b (48)	.56***	.55***	.52***	.59***	.15	.20	.21
PRF Sentience (296)	.55***	.36***	.56***	.44***	.31***	.24***	.23***
PRF Understanding (296)	.54***	.14*	.45***	.21***	.34***	.67***	.29***
SDS Artistic Interests (298)	.53***	.34***	.54***	.30***	.32***	.30***	.12*
SSS Experience Seeking (267)	.53***	.32***	.29***	.25***	.39***	.31***	.43***
Goldberg's Intellect^c (171)	.46***	.17**	.45***	.33***	.15*	.36***	.26***
ISI Autonomy (115)	.40***	.22*	.28**	.26**	.23*	.30**	.28**
PRF Change (296)	.40***	.19**	.23***	.20***	.56***	.27***	.21***
Private Self-consciousness (245)	.30***	.25***	.14*	.43***	.00	.20**	.12
SDS Investigative Interests (299)	.25***	.12*	.11	-.04	.10	.44***	.18**
HPI Intellectance (124)	.21*	-.01	.23*	-.04	.09	.47***	-.03
Median:	.53	.25	.45	.29	.31	.31	.23

Note. Ns are given in parentheses. Except as noted, all data are from Baltimore Longitudinal Study of Aging samples. Highest facet correlate of each scale and titles of measures of Factor V are given in boldface.

^aFrom J. S. Wiggins, personal communication, 1/12/92.

^bFrom McCrae & Costa, 1985a.

^cFrom Goldberg, 1992.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5
Correlations of NEO-PI Openness Scales with WAIS-R Scales

WAIS-R	Openness Domain Scale	Openness Facet Scale					
		Fantasy	Aesthetics	Feelings	Actions	Ideas	Values
Information	.31*	.11	.15	.00	.15	.27*	.33**
Digit Span	.10	-.05	.11	.08	.01	.15	-.01
Vocabulary	.29*	.15	.25*	.11	.15	.22	.20
Arithmetic	.03	-.01	.00	.06	-.03	.17	-.09
Comprehension	.31*	.18	.21	.11	.09	.19	.29*
Similarities	.30*	.09	.27*	.12	.15	.18	.22
Picture Completion	.07	.03	-.07	-.11	.03	.25*	.20
Picture Arrangement	.20	.07	.09	.02	.18	.20	.05
Block Design	.35**	.23	.17	.06	.22	.36**	.14
Object Assembly	.34**	.18	.26*	.11	.29*	.22	.18
Digit Symbol	.20	.14	.05	.17	.09	.16	.12
FULL SCALE	.33**	.18	.23	.11	.19	.33**	.21

Note. $N = 67$ men and women aged 17 to 86.

* $p < .05$. ** $p < .01$.